

Empty Marine Container Management in a Port MegaCity Region



Maria Boilé, Ph.D.

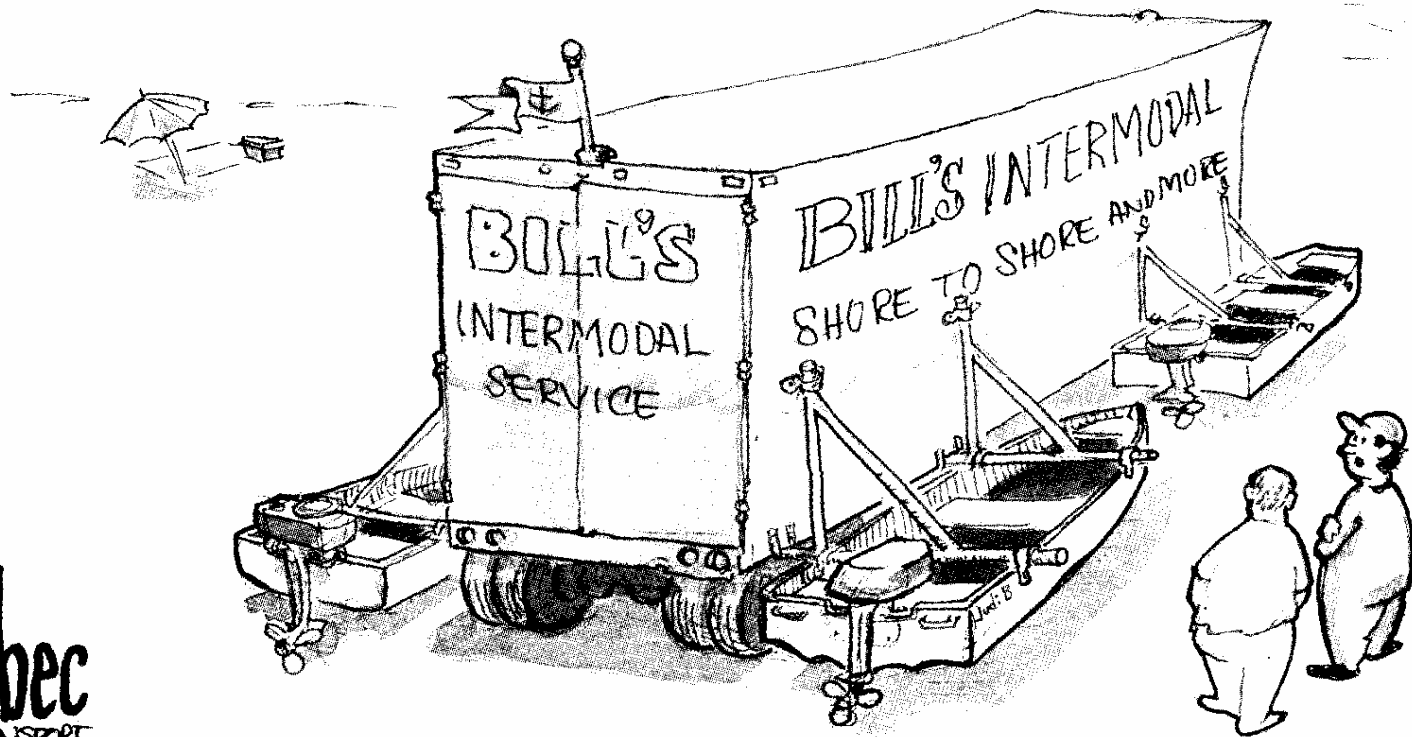
**Assistant Professor and Director of Research and Education
Maritime Infrastructure Engineering and Management Program, Rutgers University**

**NYMTC
October 19, 2005**

Define the Problem



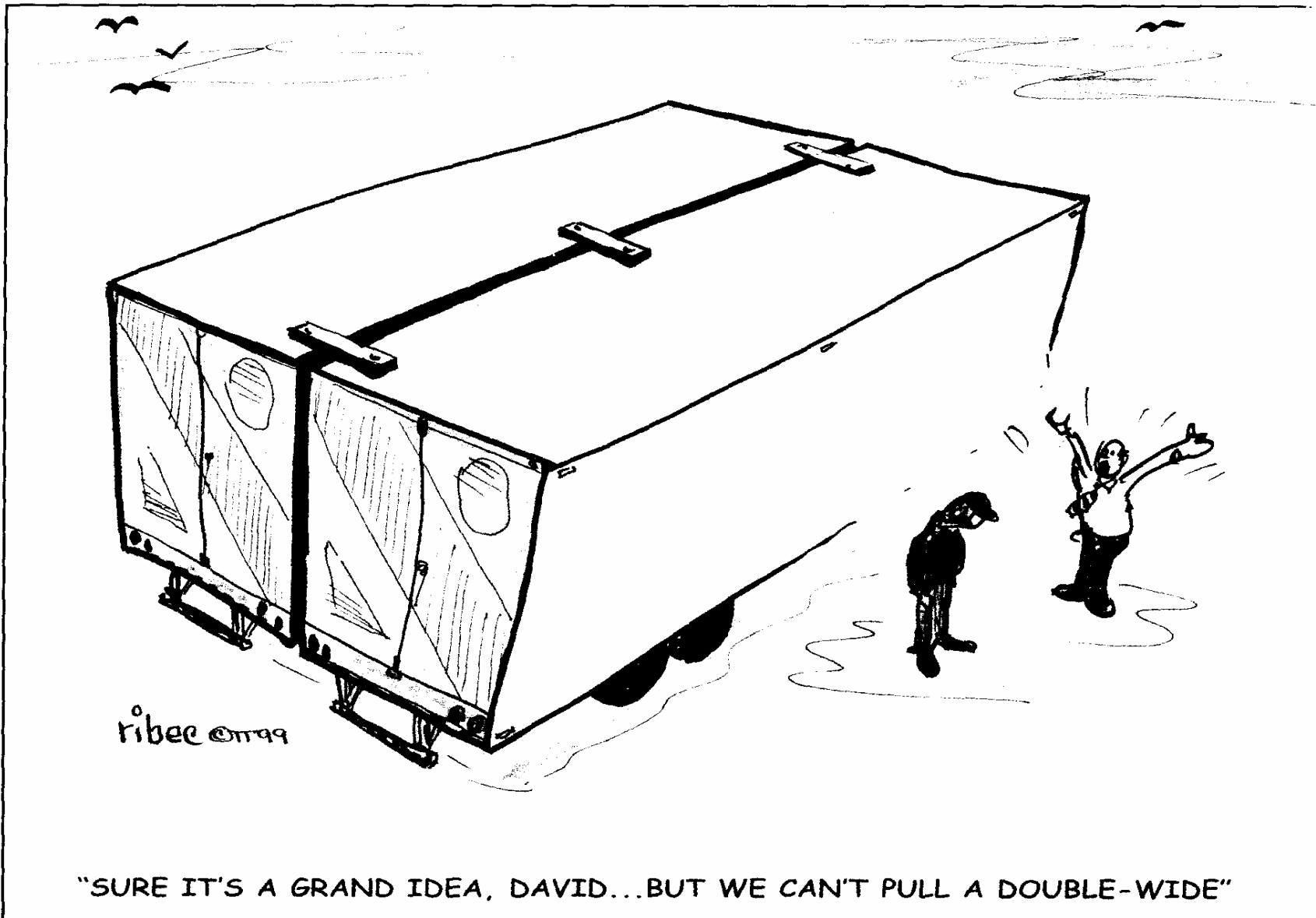
Understand how goods move



ribec
TRANSPORT
TOPICS © 99

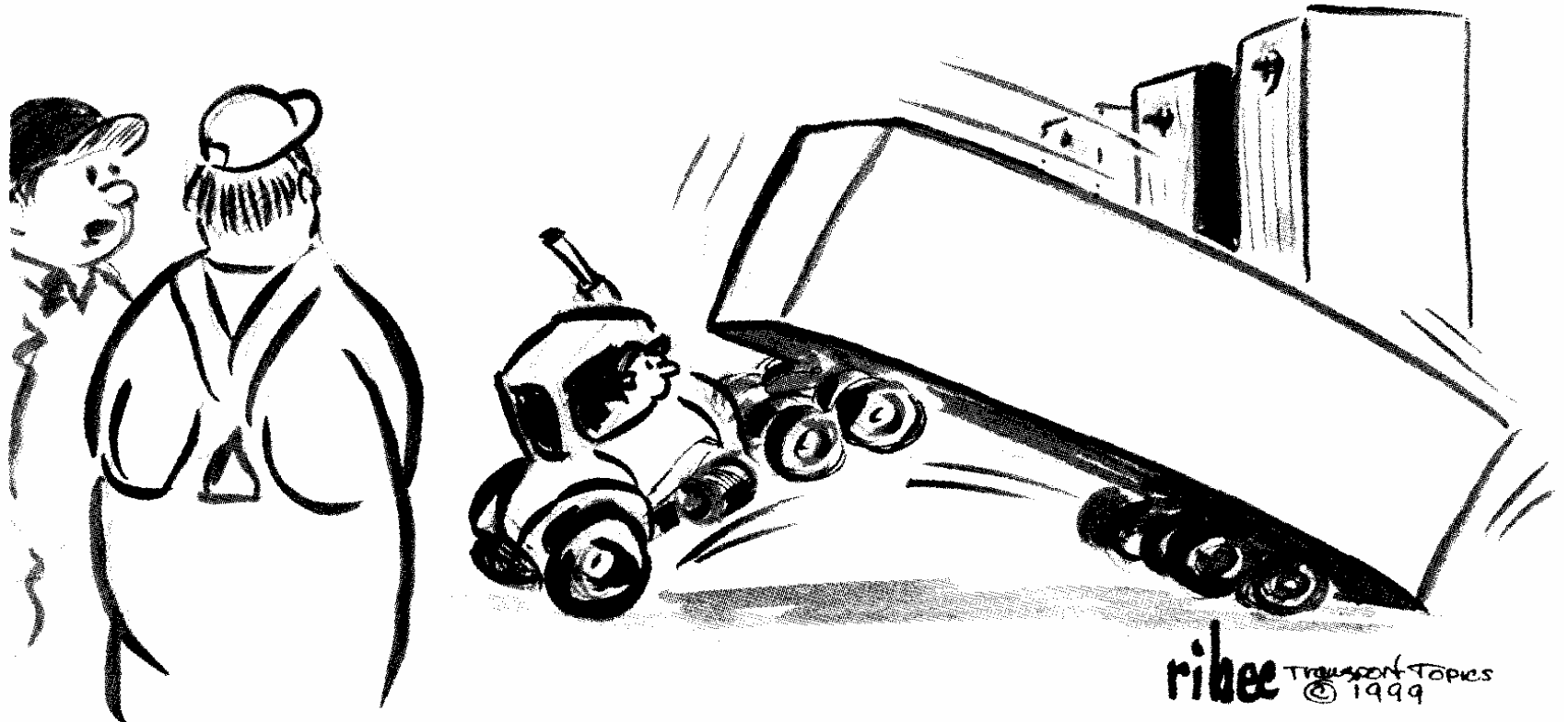
"NO THANKS...I DON'T EVEN WANT TO WATCH"

Solutions – Minimize VMTs



"SURE IT'S A GRAND IDEA, DAVID...BUT WE CAN'T PULL A DOUBLE-WIDE"

Solutions – Efficient use of yard space



"YEAH, IT LOOKS DUMB, BUT IT SURE SAVES YARD SPACE"

Outline

- Recent Studies
 - Problem Context
 - Root Causes and Current State of Practice
 - External Environment and the Regional Context
 - Major players and their interactions
 - Patterns of empty container movements
 - Issues in Tackling the Problem at a Regional Level
 - A Decision Support Tool
 - A Strategic Decision Perspective Applied to New Jersey
 - Conclusions
-

Recent Studies

Scientific Articles

- Empty equipment management primarily focusing on equipment transportation optimization and matching opportunities
- Some attempts to model empty container accumulation within the above context

Industry Reports

- Practices adopted in the US and other parts of the world
- Supply and demand dynamics

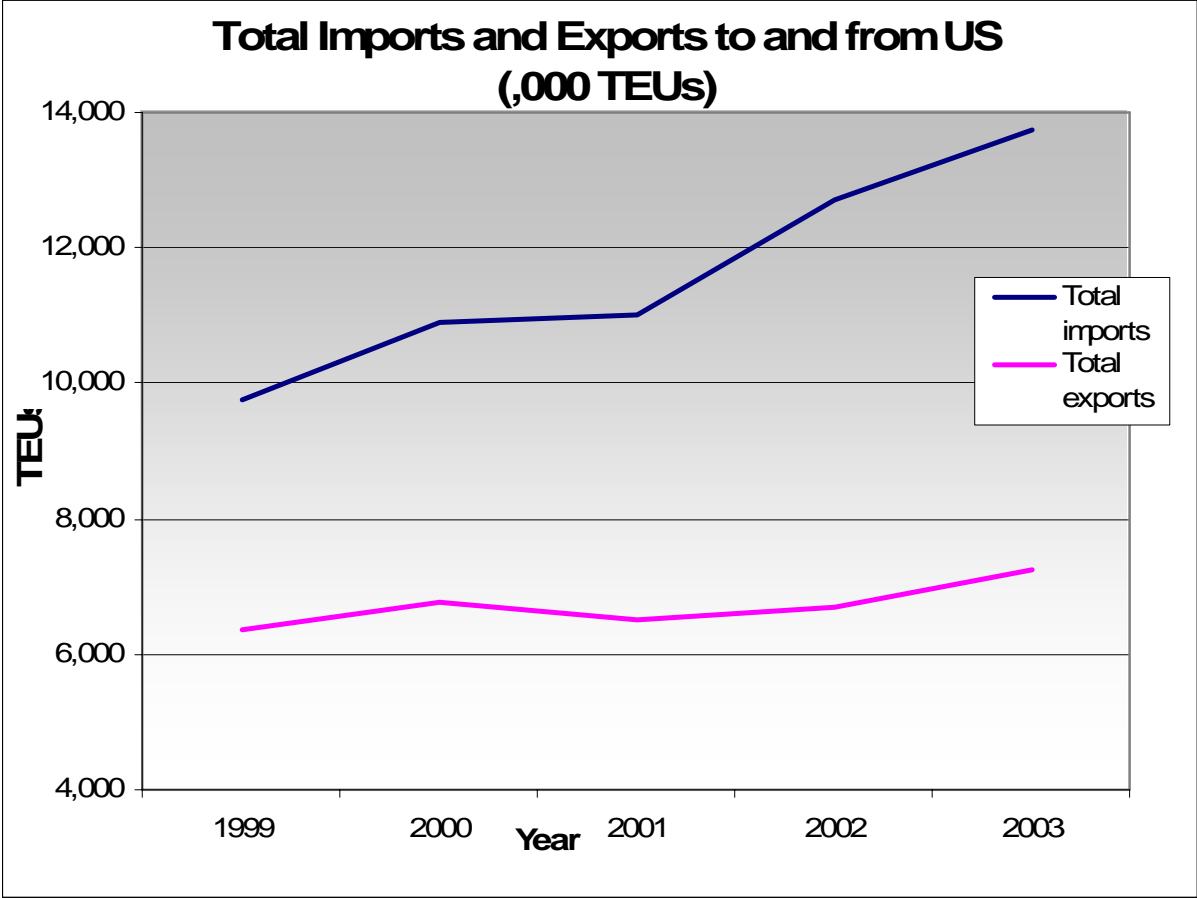
Issues in modeling the complex business environment influencing the global marine container management problem

- Dynamics of global conditions
 - Difficulty in relating them to those prevailing at a regional level
 - Conflicting goals and interests of the stakeholders
-

Problem Context

- Global container population in million TEUs: 16 (2001), 18.8 (2004), 21 (2005 est.), 23.2 (2006 est.)
 - \$110 billion per year spent to manage shipments globally, 15% (\$16.8 billion) associated with inefficiencies in container operations (including empty containers 'idle time') (2001 estimate)
 - Empty containers accounted for 20% of the ocean container movements at a cost of \$3.5 billion a year (early 1990's)
 - In 2003 the percentage was about the same but the cost escalated to more than \$11 billion (not counting overland repositioning and 'idle' cost)
 - In 1997, 8.7 million loaded containers were imported in the US and 6.4 were exported. Since then the difference has increased.
-

Problem Context



Problem Context

- In the past, it has been cheaper for freight companies to buy new containers overseas than to ship empties back.
 - In 2004 there was an unpredicted hike in steel prices. Price of a new 20ft dry box went up from about \$1,400 to over \$2,000. Lease rates also soared by about 50%.
 - Shipping lines began repositioning empty containers spending about \$1,000 for each container.
 - A survey of more than 600 depots in North America shows a decline of empty box supply by 41% over a three month period (early 2005).
 - Steel prices dropped, carriers' share of container ownership increases, trade volumes increase, vessel capacity increases.
-

Root Causes

- Trade imbalance
 - New container prices vs. cost of inspecting and moving empties
 - High storage fee in areas of high demand for empties
-

Trade imbalance

- Cited as the number one factor contributing to the empty intermodal container accumulation problem.
 - In New Jersey, there is an imbalance close to a two-to-one ratio imports to exports
 - In year 2004, as the total US containerized (overseas) import grew faster (13,2%) than its export (8.4%), the container imbalance between both cargo flows reached an all time high of 50%. In other words: no less than 7.7 million TEUs had to leave the largest economy in the world empty again. Theoretically, eighteen 8,200 TEU ships per week are required to evacuate such a volume, which underlines how major a headache this must be for whichever carrier is involved (Dyna Liners, 06/05, January 2005)
 - Imports into US grow faster than its exports
-

Trade imbalance

Grand total to and from the US (five years)

	<u>2003</u>	<u>2002</u>	<u>2001</u>	<u>2000</u>	<u>1999</u>
Total imports	13,748	12,693	11,023	10,890	9,746
Total exports	7,230	6,693	6,520	6,771	6,363
Total	20,978	19,386	17,543	17,661	16,109
Growth TEU	1,592	1,843	-118	1,552	1,027
Growth%	8.20%	10.50%	-0.70%	9.60%	6.80%
Imbalance	6,518	6,000	4,503	4,119	3,383
Imbalance%	47%	47%	41%	38%	35%

New container prices vs. cost of moving empties

- New container prices used to be very low compared to the cost of repositioning, or storing and inspecting old containers.
 - The steep increase in the steel prices and the steep rise in demand for maritime transportation using containers has changed this trend dramatically.
 - The sharp increase in factory container prices has resulted in substantial increase in leasing rates.
 - The shipping Digest in May 2004 reported that it costs leasing companies about \$1,200 to reposition an empty container from the US East Coast to Asia, whereas the new containers are built at a cost of over \$1,300. During the year 2004, prices for new built boxes rose further. For a 20 ft dry cargo box China factory figures of USD 1,900/2,100 are reported.
 - The situation is highly dynamic and unstable.
-

High storage fee in areas of high demand for empties

- High storage charges are incurred in the areas of strongest demand, such as Hong Kong, South Korea and many coastal locations in China.
 - These same costs are generally lower in North America and parts of Europe, where the secondary market for containers is also better developed.
 - Lessors have a choice: to reposition their idle containers into more expensive, but higher demand areas in Asia, or leave them in cheaper locations, where the best option may be to sell the unit out of the fleet altogether
-

Current State of Practice

Keeping empty containers part of the intermodal transportation system solutions

- Managerial (grey box concept, box pools, horizontal diversification, etc.)
- Policy (stack height, number of boxes in a facility, days stored, etc.)
- Logistics (optimal use of modes and options)
- Technology (increase matching opportunities)

Secondary uses of empty containers (storage, gas stations, sales center at building sites, workers villages, etc.)

Recycle of empty containers

External Environment and Regional Context – Major Players

- Carriers, including global and niche carriers
 - Container leasing companies
 - Depot enterprises (handle, store and repair empty containers and may own a small share of them)
 - Major shippers (may own a small amount of containers for their dedicated use)
-

Major players and their interactions

Structural changes in shipping liners world

- Carriers integrating their resources, forming alliances and groups, mergers and acquisitions, cooperation agreements regarding slot exchange and ocean carrier consortia and joint services
 - Carriers are getting involved in horizontal and vertical integrations with the other organizations in port operations, freight forwarding, logistics services and inland transportation
 - Carrier firms charter each other's capacity (slot chartering), which results in more container movements and fewer ship miles
-

Major players and their interactions

The container leasing business

- Economic benefit and flexibility to carriers, especially in periods of high demand for containers
 - Large container leasing companies capitalize on the convenience of their worldwide facilities and container availability
 - Smaller companies capitalize in areas where they can provide closer personal service to selected customers
 - Lessors owned about 47.5% of the total TEUs in 1999, a share that was reduced to just over 43% in 2002.
-

Major Lessors' Container Fleet on Operating Lease of all Types in Inventories of over 100,000 TEUs

COMPANY	2004 SHARE(*)	2004 TEUs(*)	2003 TEUs	2002 TEUs	2001 TEUs
CAI	6%	580	541	476	430
Capital	5%	465	428	318	240
Cronos	5%	426	410	390	375
Florens(**)	10%	908	805	685	571
Gateway	3%	311	300	300	265
GE SeaCo	10%	975	1,010	940	960
Gold	3%	256	250	200	195
Interpool	9%	891	895	795	702
TAL Int.	11%	1,030	1,105	1,050	920
Textainer	12%	1,169	1,115	1,005	965
Triton	15%	1,367	1,147	1,022	916
Others	11%	1,019	834	719	666
Total	100%	9,395	8,840	7,900	7,205

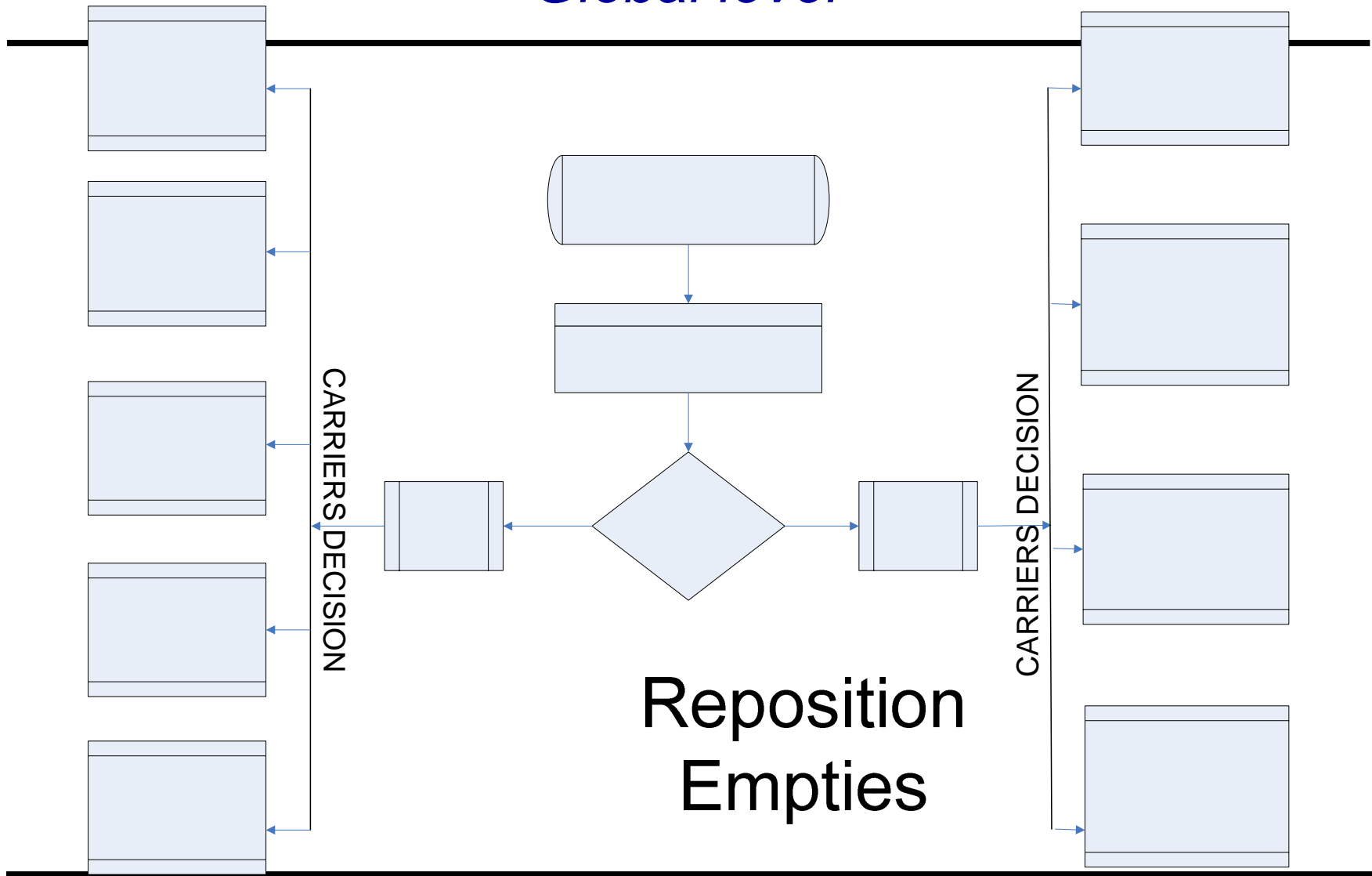
Notes: 1. Figures in TEUs*1,000
2. (*):estimated
3. (**) includes containers leased to Cosco
4. CAI is a 50% affiliate of Cosco

Major players and their interactions

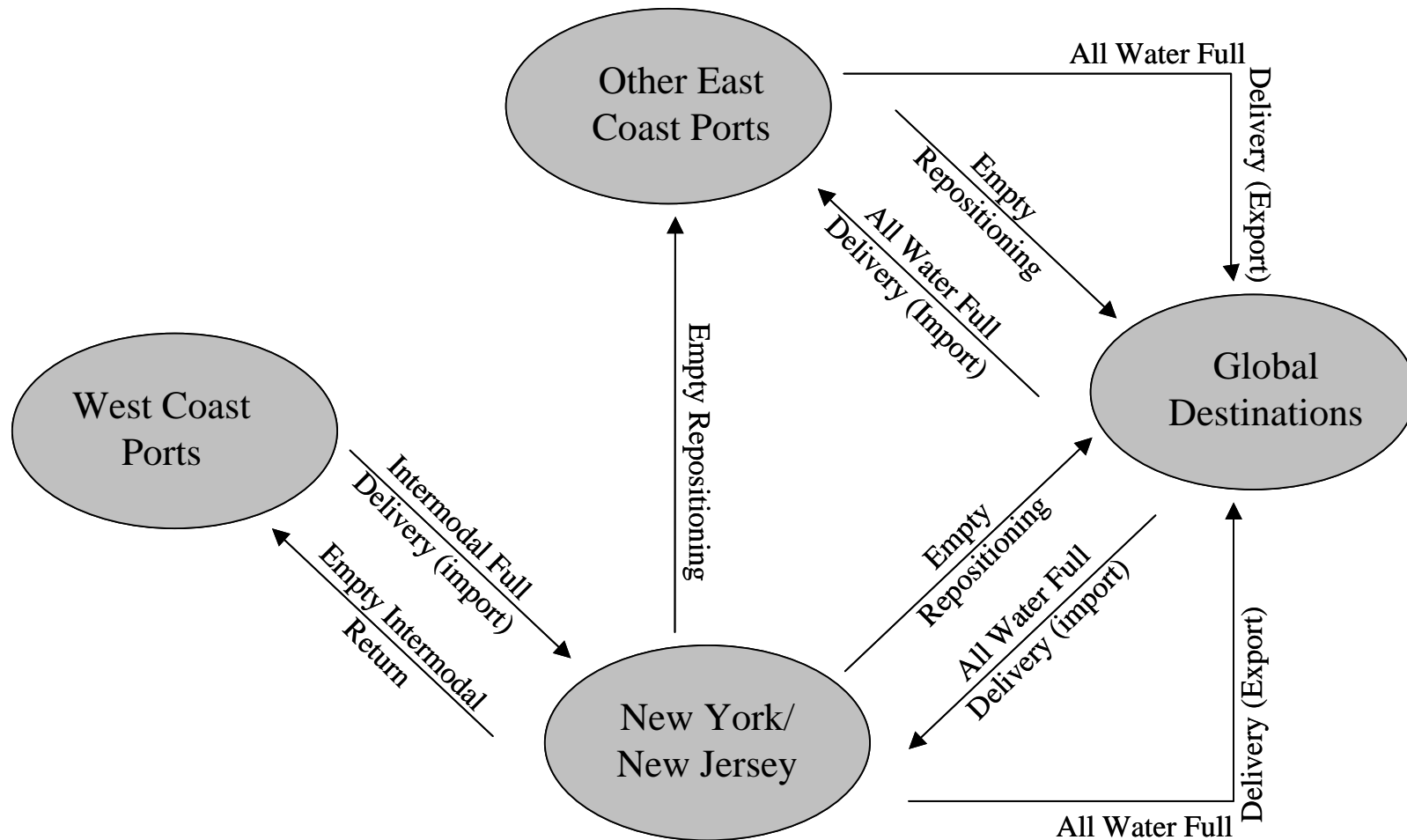
- Carriers handle containers as transportation equipment, while leasing companies consider them as assets, seeking to cover depreciation and make profit out of their leasing.
 - When ocean carriers have been faced with strengthening demand, rising container prices, lengthening delivery lead times and shortfalls in immediately available stocks they tended to lease in greater amounts and take the cost of moving containers from surplus to demand areas at their own expense.
 - Currently there is tendency for major carriers to enter the box manufacturing
 - Long term leases have significant impact on the throughput volume in depots as lower gate volumes from leasing companies mean lower repair revenues to depots.
-

Patterns of empty container movements

Global level



Patterns of empty container movements Regional level



Notes:

Empty repositioning to other east coast ports almost exclusively all water.
Empty Intermodal return to US west coast ports insignificant.

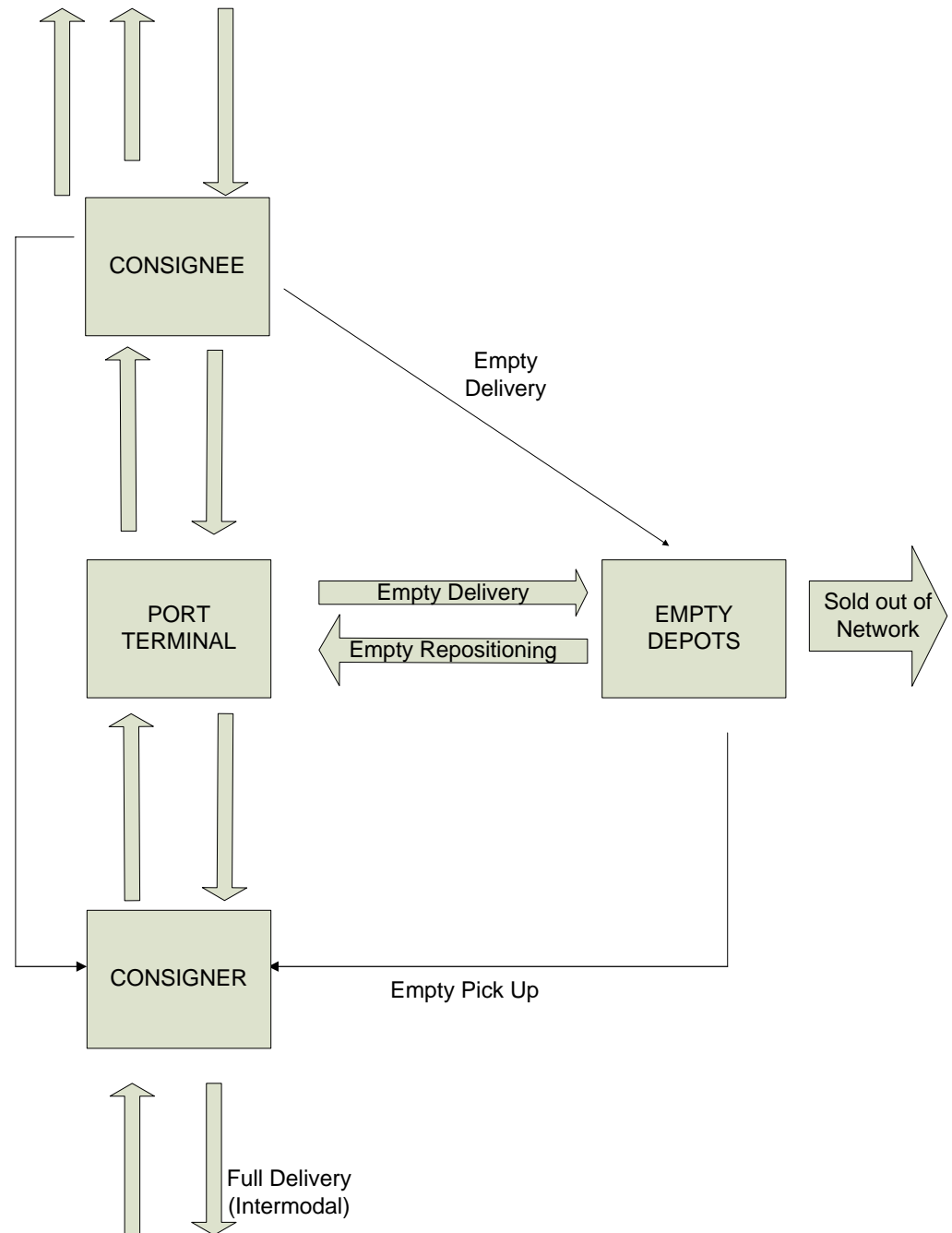
Patterns of empty container movements

Local level

From consignee's premises:

- Return to the marine terminal
- Send full to the next destination
- Reposition it intermodally
- Return it to a depot
- Street-turn it to the next customer

From marine terminals to depots



Regional Context

- The Port of NY/NJ is the largest port on the east coast of the United States. Each year more than 21 million tons of ocean borne general cargo moves through this port, including 3.75 million TEU's of containerized cargo.
 - Statistics show that this port handles more than 14 percent of the entire nation's container imports and 12 percent of the exports (2001 statistics).
 - The volume of loaded and empty containers has increased each year with 14.7% in 1999, 7.8% in 2000, 8.7% in 2001 and 13% in 2002.
 - With such high numbers of container handling, the port needs large amounts of storage space. Estimates are that there is around 400 acres of land currently devoted to the long-term storage of the empty containers in the 10-mile radius of the port of Newark/Elizabeth in New Jersey.
-

Regional Context

- The New Jersey State authorities aim to discourage container storage on prime locations around the port. Proposed actions include taxing dormant containers that remain empty or unused for 90 days or more, imposing weight and height limitations on empty container stacks, limiting the number of containers that can be stored on a certain square footage of land.
 - The industry perspective is different and the concern is that actions such as the proposed ones would hurt the business and the efficient operation of the port.
 - In April 2004, The Business Media Journal of Commerce reported that during the last few months and for the first time in years, the big container stacks at the ports in the US has been seen to shrink.
-

Regional Context

- The big stacks of containers near major ports started shrinking. Reasons:
 - Steal prices
 - Higher utilization rates
 - ‘booming demand’ and ‘tight supply’
 - Container shipping is cyclical, eventually the current conditions will change, and we'll see another accumulation of containers
 - Period of low accumulation - best time to develop and approve long term plans
 - maintain a balance of empty containers stored in the region
 - provide incentives to move old containers out of the transportation system and into other uses or sell them in the secondary market
 - implement a monitoring program which will assist in dealing with the problem in the near future and in the long run
-

Empty Container Categories

- Empty containers stored in depots fall within the following categories:
 - Those that are within the transportation network, temporarily stored, waiting to be filled and exported or to be repositioned back to demand areas.
 - Those that are long term stored, waiting to be sold in the secondary market, aged (more than ten years) and effectively out of the transportation network.

 - The two categories of empty containers mentioned above require different approaches:
 - Those in the network require an industry based initiative to increase matching possibilities and decrease empty trips.
 - Those out of the network require periodically reviewed measures to increase the possibility of removing to secondary market or to scrap.
-

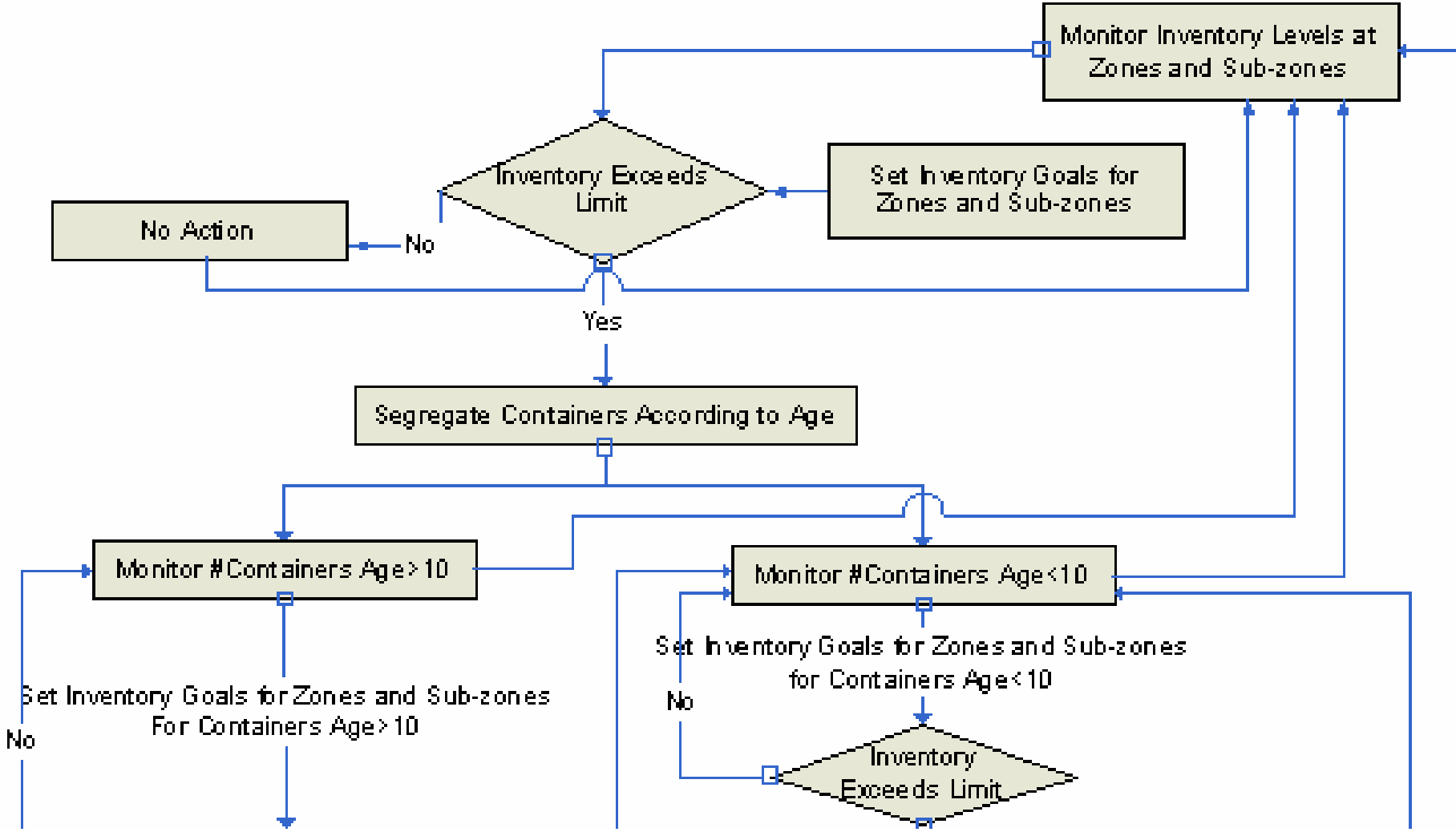
Issues in Tackling the Problem at a Regional Level

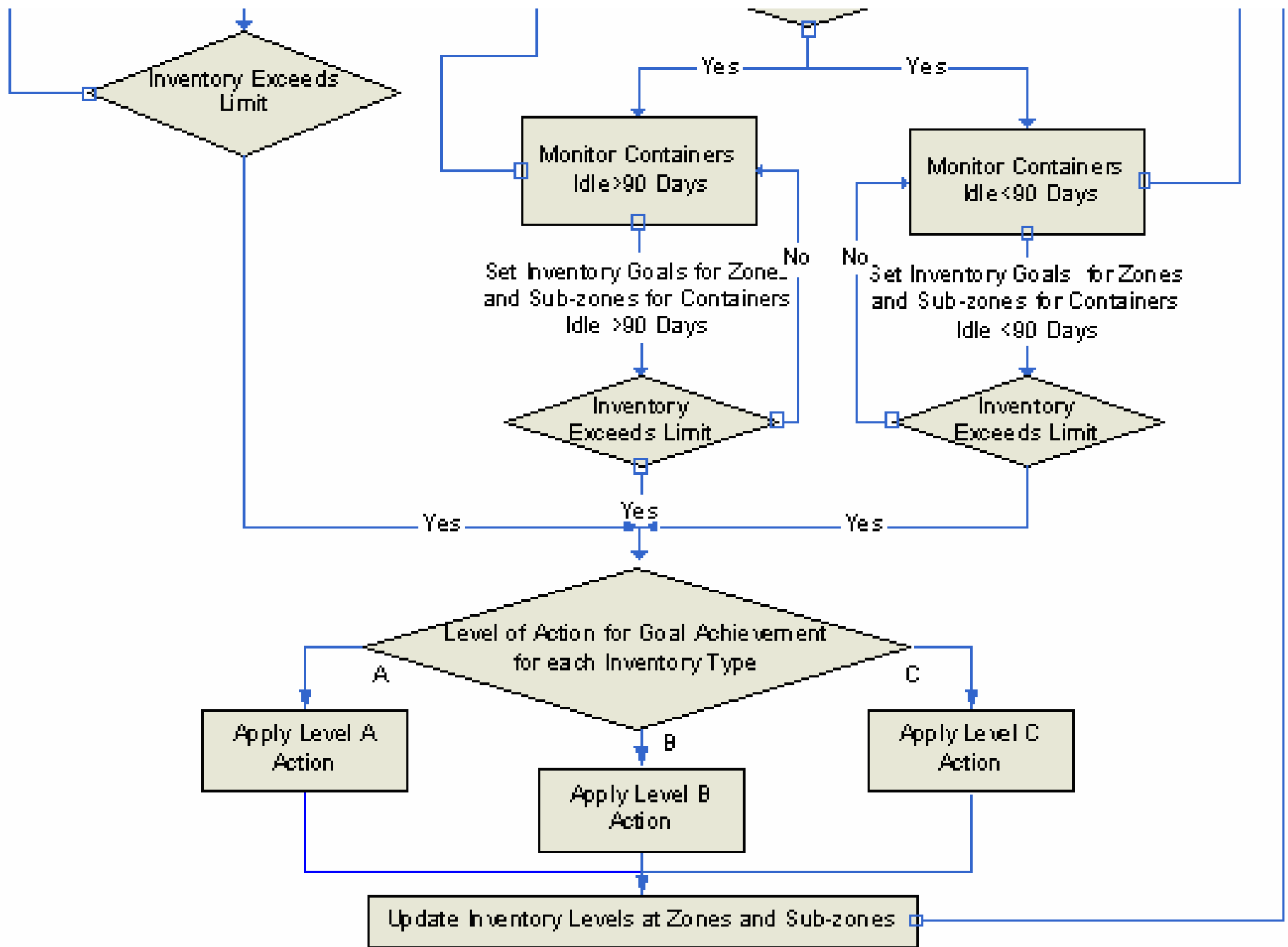
- Empty container logistics is a global issue, influenced by international transportation practices, governed by global trade patterns and mostly dictated by major ocean carriers' interests.
 - Complete and direct control of empty container accumulation at a regional level falls beyond the ability of local and regional authorities.
 - Institutional, fiscal or regulatory measures can be proved inefficient in lessening the accumulation problem and even detrimental to the competitive position of transportation resources of the region in the international marketplace if the global environment is not considered in formulating them.
 - Both the external environment and the structure of the transportation industry in the region should be taken into account
-

Issues in Tackling the Problem at a Regional Level

- All policies should be taken bearing in mind the very dynamic nature of the maritime transportation industry.
 - Authorities involved in formulating and implementing these policies should ensure thorough understanding of the global container logistics and precise monitoring of container accumulation in the region.
 - In applying measures, short, medium and long term interventions and expected results should be considered.
 - A stepwise and scale responsive approach is required.
-

A Decision Support Tool





Measures

- **Level A** (Short Term) May also be called “Operational”, although not all of them are operational
 - **Level B** (Medium Term) may also be called “Tactical”
 - **Level C** (Long Term) may also be called “Strategic”
-

Level A: Short Term Measures

- Equipment matching opportunities (Assisted by a VCY)
 - Tax write-off for income gained from selling old containers
 - Taxation for aged containers (Scale up with idle time)
 - Change in demurrage charges (Scale up with idle time scaling)
 - Free-time period
-

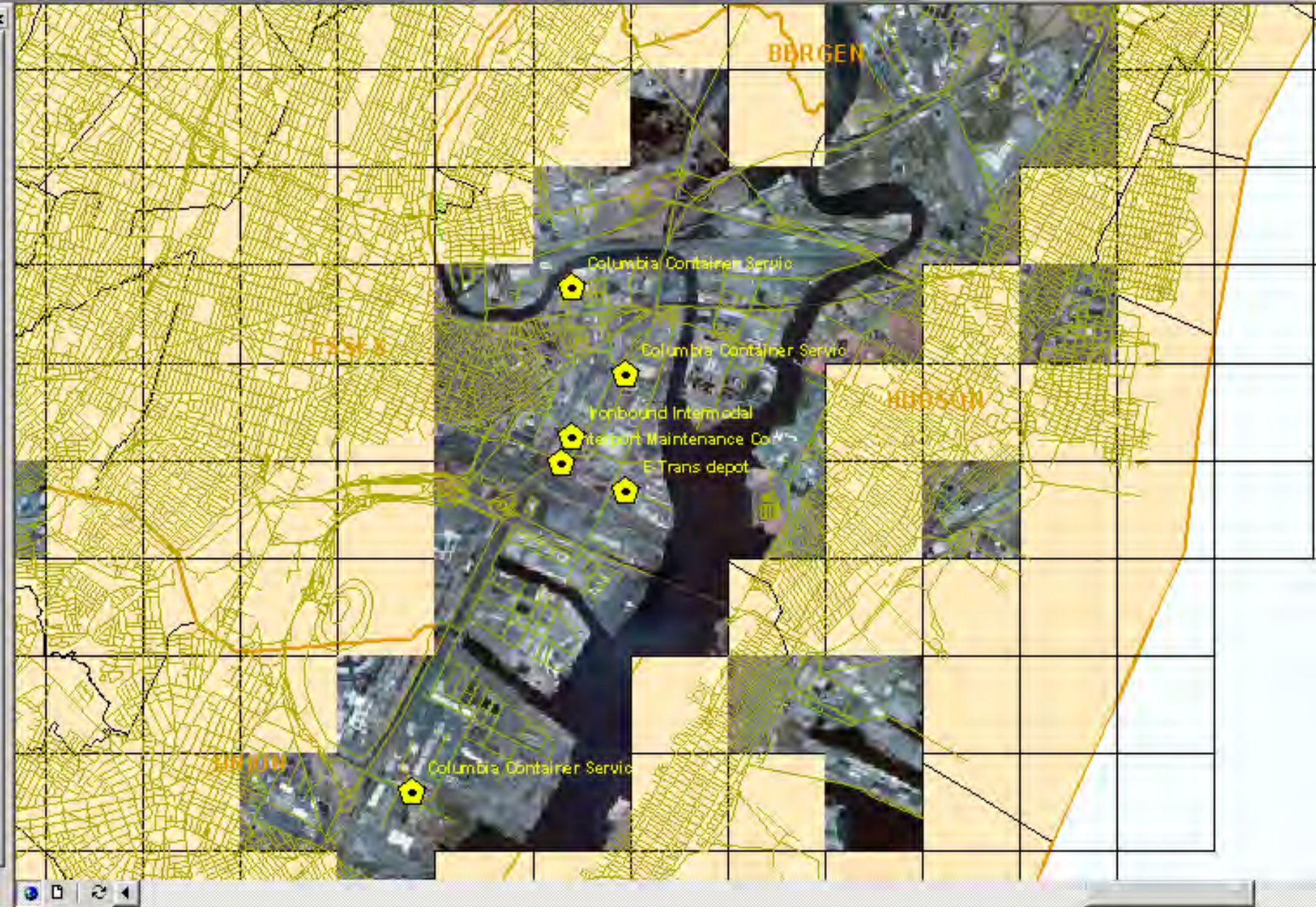
Level B: Medium Term Measures

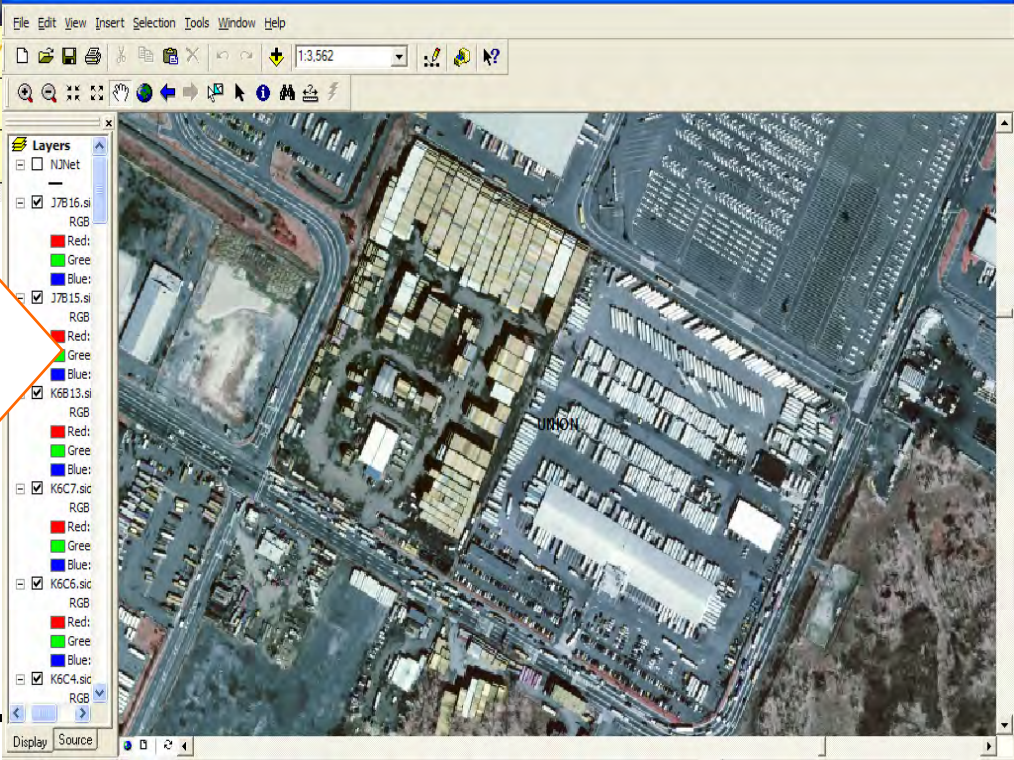
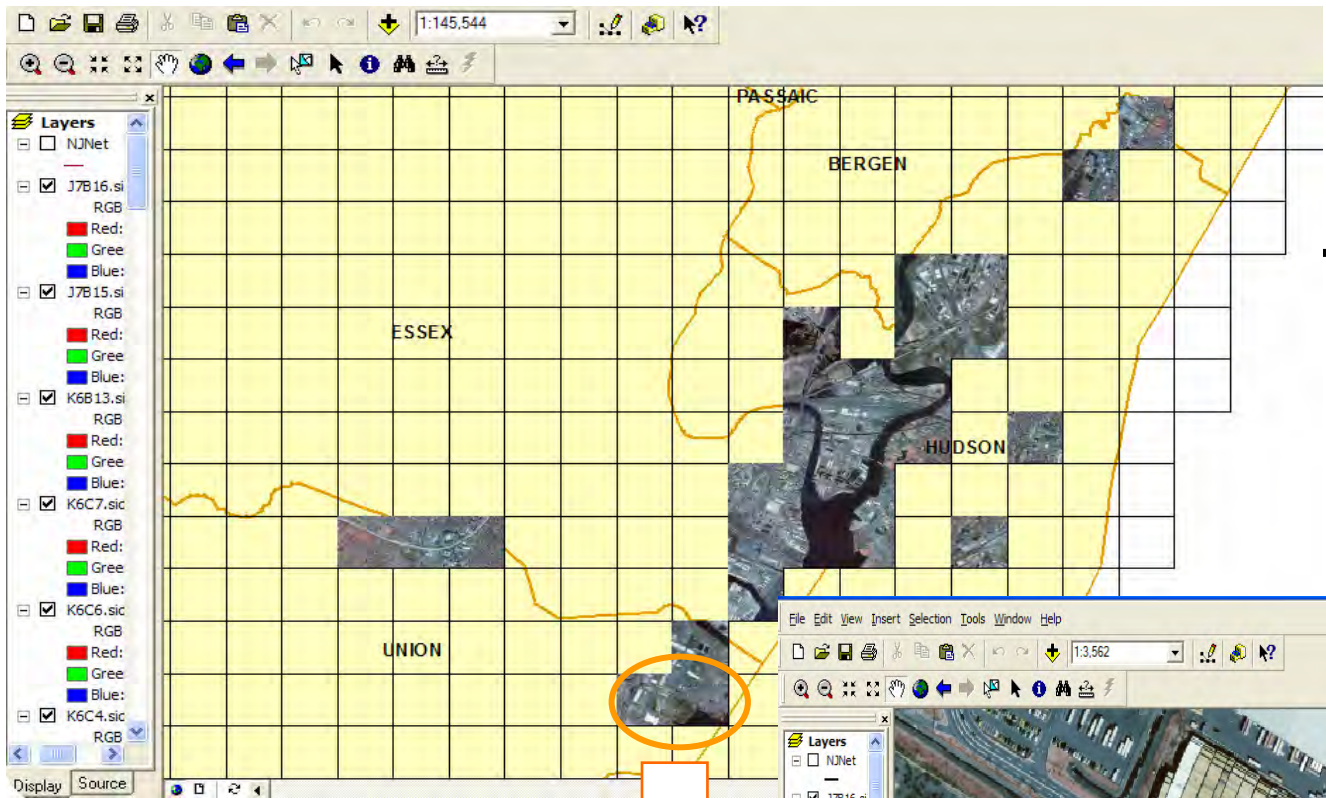
- Capacity constraints - eg. Limit height to stack of three containers in height like Chicago, or limit to a maximum of x containers per depot and y containers per sub-region (concurrently)
 - Tax write off incentives - limit depreciation period from 15 to 10 years, so that the exempted from taxation annual depreciation to be raised accordingly, but with the obligation to sell boxes after ten years of economic life to secondary market.
 - General Taxation - for containers being idle for x period of time in a depot or in a sub-region (irrespective of the retention time in a specific depot in the region)
-

Level C: Long Term Measures

- Develop new zoning rules so as to raise disincentives of locating or operating depots (including measures to discourage location of additional depots in a certain sub-region).
 - Relaxation of brownfield land use impediments – investigate the possibility of alternative uses which will raise land value and will make it not economically beneficial to have a depot.
 - Incentives to develop more profitable land uses, resulting in the indirect effect of raising land value (ex. dedicated corridors or priority truck lanes).
-

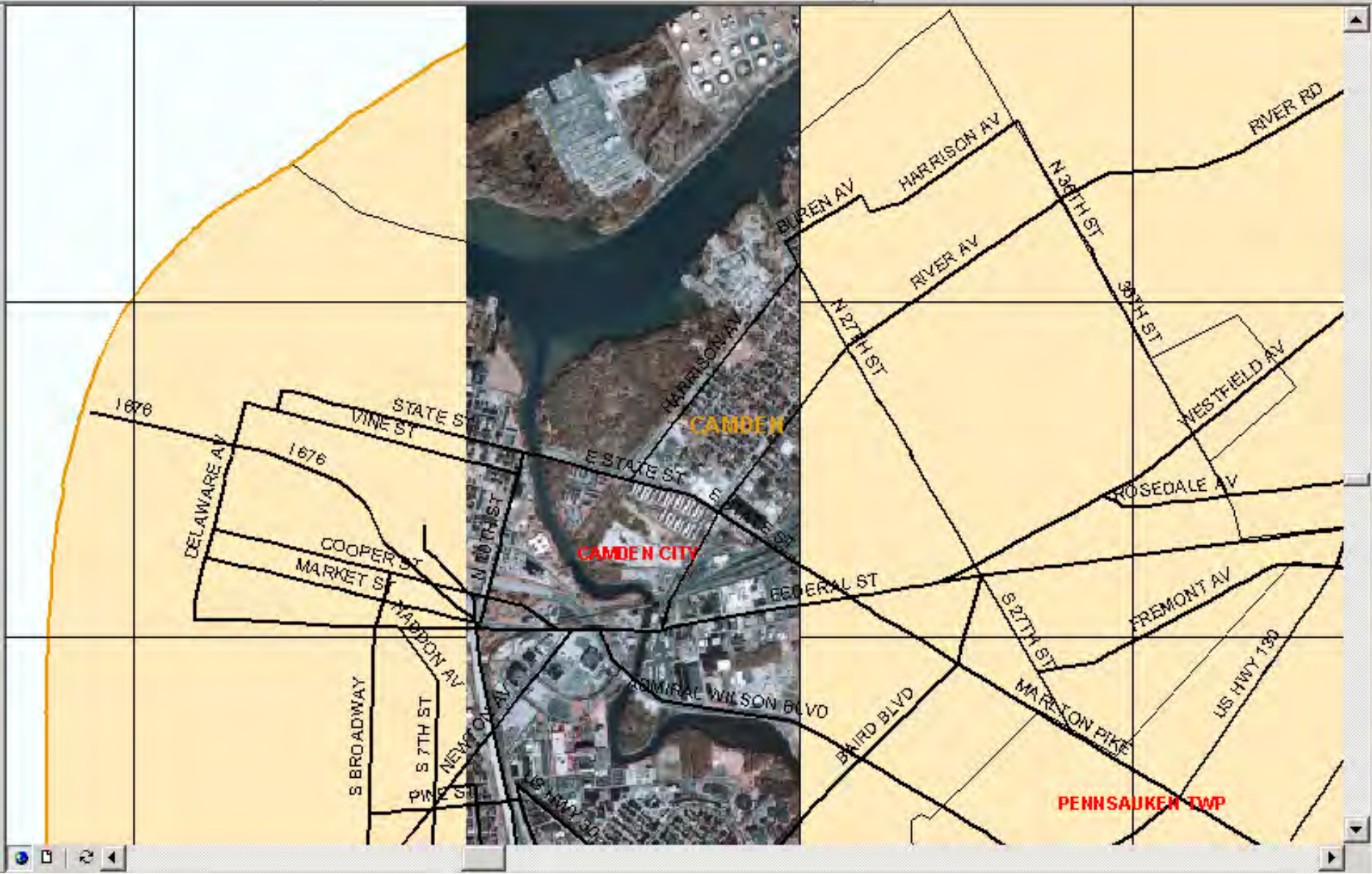
Monitoring System







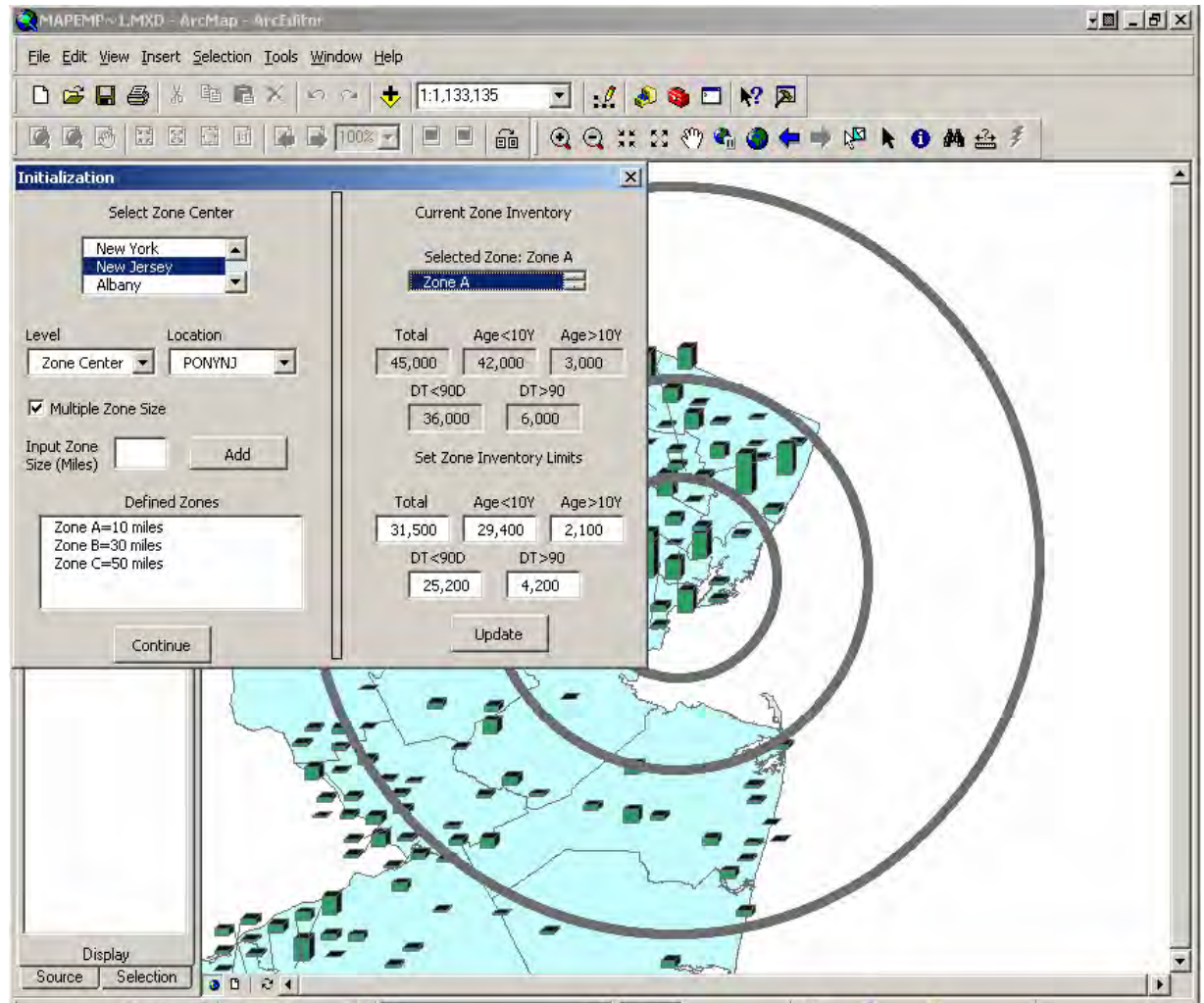
Container locations in Camden City, Camden





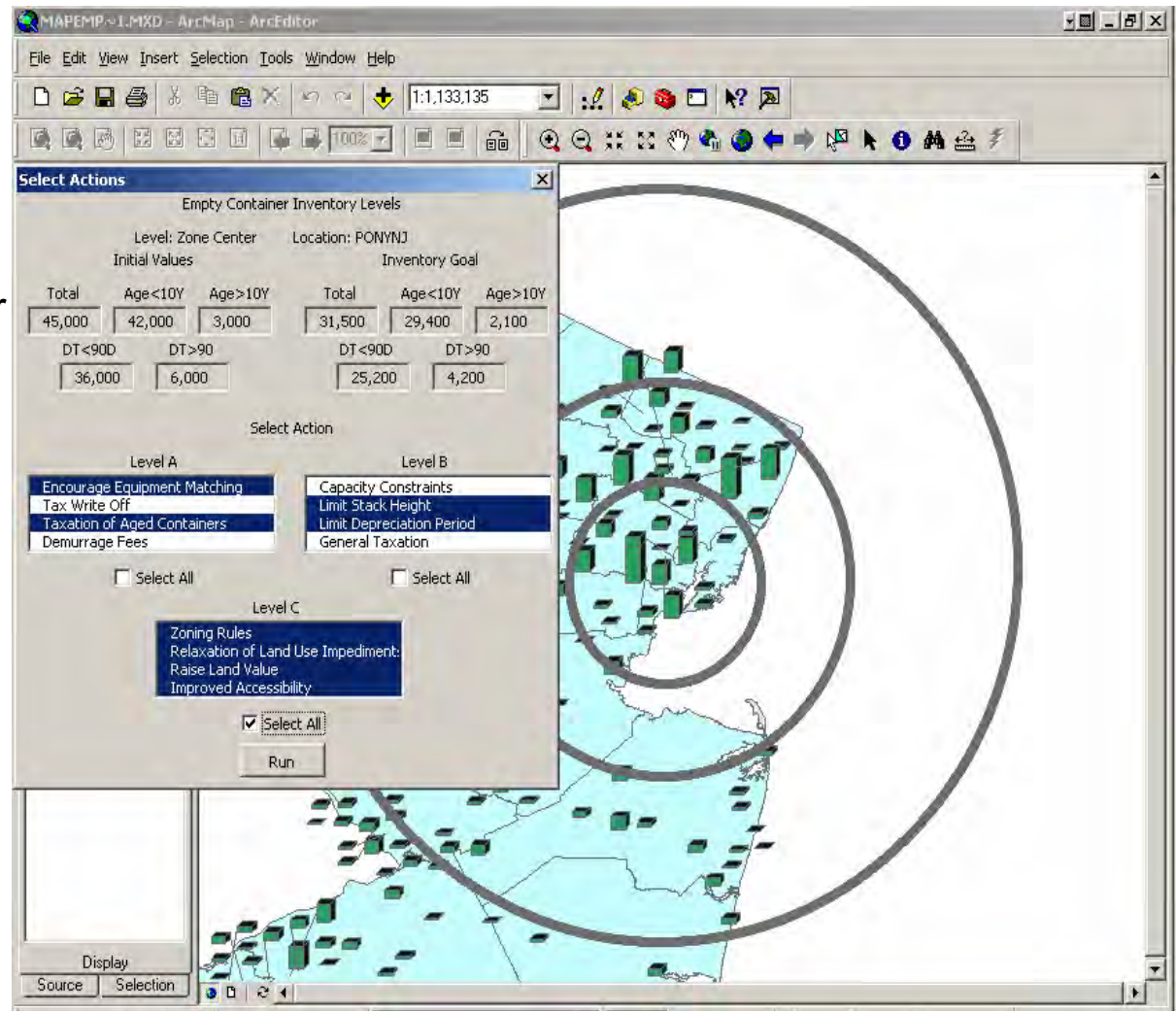
A Strategic Decision Perspective Applied to New Jersey

- Determine the facility or zone(s) and sub-zone(s) to be analysed
- An individual facility, county, zip code or an area within a certain radius from a particular location may be selected
- Select the zone to be analysed first
- Set the desired inventory limits for each inventory group within this zone
- Initiate procedure to evaluate alternatives



A Strategic Decision Perspective Applied to New Jersey

- A list of possible actions is available
- Three levels (described previously)
- Ability to select all or a number of the actions available
- Dynamic tool for what-if scenario analysis (test exclusion of actions that are deemed to be unacceptable for certain locations, periods of time or to individual stakeholders)
- Additional measures may be added depending on the policies to be adopted



Conclusions

- Dormant containers are considered to be a major economic, environmental and social concern.
 - Moving empty boxes is costly and unproductive.
 - The efficiency of the intermodal transportation system lies on having the right equipment in the right place when needed.
 - Dynamic, macro-economic issue.
 - Many stakeholders with different objectives and complex operating conditions.
-

Conclusions

- Develop a monitoring system to map the situation.
 - Develop a cooperative stakeholder platform to converge different viewpoints and assist policy and decision making.
 - Stakeholder collaboration and understanding of interests and operational constraints may assist in taking more wise and educated decisions and addressing the problem in an effective, yet pragmatic way.
 - Addressing the problem at a regional level requires a collaborative approach.
 - Define the problem and examine conditions that will not hurt the economic benefit to the region and the competitive advantage of the port.
 - This research work is still underway.
-

Empty Marine Container Management in a Port MegaCity Region



Maria Boilé, Ph.D.

**Assistant Professor and Director of Research and Education
Maritime Infrastructure Engineering and Management Program, Rutgers University**

**NYMTC
October 19, 2005**
